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THE WOODFROGS OF JAPAN.

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When treating of the woodfrogs, or grassfrogs, in the Herpetology of Japan (Bull. U. S. Nat. Mus., No. 58, 1907), I doubted the occurrence of *Rana japonica* in Yezo (p. 111) and there was then no suspicion of *Rana temporaria* occurring in Hondo. At the same time I referred Werner's *Rana japonica* var. *ornativentris* as a synonym to *R. japonica*, chiefly for the reason that I had before me similarly colored specimens among the specimens brought home by myself from Yokohama, which were undoubtedly *R. japonica* and others, apparently identical, from Mt. Fuji, obtained through Mr. Allan Owston. As to the status of Boulenger's *Rana martensi* from Tokyo, I confessed (p. 108) my inability to separate it from true *R. japonica* from the same vicinity on account of the vagueness of the characters ascribed to it.

A recent study of the related forms occurring in China has thrown new light on the difficult question of the various species and subspecies of woodfrogs in the Far East and led to a reexamination of my Japanese material.

The fact that the Old World frogs of the so called *temporaria* group again fall into two subgroups, each typified by *R. temporaria* and by *R. dalmatina* (=*agilis*) respectively, has long been vaguely felt and more recently definitely recognized, but the main character relied upon, namely the relative length of the hind legs has been found to be so lacking in definiteness and subject to so much overlapping variation as to be almost useless in practical application, unless reenforced by additional characters. As far as the European species are concerned, Boulenger's key in his Tailless Batrachians of Europe, pt. 2, 1898, pp. 263–264, gives satisfactory results, but with the East Asiatic forms the problem was still unsolved, as evidenced by the fact that such an experienced herpetologist as Dr. Boettger, though with many

misgivings, identified the frogs from Chinhai, northeast of Ningpo, China, as *Rana amurensis, martensi* and *japonica*. Similarly the statement regarding these frogs by Dr. Wolterstorff (Abh. Mus. Magdeburg, vol. 1, 1906, p. 126) indicates the same uncertainty.

During my study of the Chinese woodfrogs I was equally puzzled until I discovered that the anterior course of the dorsolateral fold seemed to be different in the two subgroups. In *R. temporaria* and its nearest allies these glandular folds anteriorly flare outward so as to head almost directly for the center of the tympanum and meeting above the latter at an angle the fold coming from the posterior angle of the upper eyelid. These relations are strikingly apparent in plates 19 and 21 of Boulenger's Tailless Batrachians of Europe. In *R. dalmatina* (*agilis*) and its allies, as far as I have been able to examine them, the glandular ridges proceed straight or almost straight from the scapular region to the upper eyelid without an angular dip toward the tympanum. The contrast between the two styles is easily appreciated by comparing figures 1 and 3 on pl. 11 of my Herpetology of Japan (Bull. 58, U. S. Nat. Mus., 1907). In museum specimens too soft or too hard or otherwise distorted, it is sometimes difficult to come to a definite conclusion as to the actual relation, but this difficulty is encountered with the application of most characters in the case of such closely allied and variable batrachians as these.

Reexamining my Japanese material with this distinction in mind, it was at once demonstrated that—apart from the typical *R. temporaria* in Yezo—there were two distinct species of woodfrogs represented in the material from Hondo, the main island. Tested by the dorso-lateral gland the specimens enumerated on pp. 111–113 of the Herpetology of Japan fell into two groups: Nos. 11336–11344, from "Japan" and Nos. 34448, 34449 and 34451 from Mount Fuji had glands like *temporaria* or *amurensis* and all the rest had them like the figured specimen of *japonica* and specimens of *dalmatina*. Another striking feature disclosed was that all the Hondo specimens of the *temporaria* style had large black spots on throat and other parts of the underside, while the others were either entirely unspotted or had only more or less faint dusky markings.

Having settled that we have to deal with two species of woodfrogs in Hondo, the next question is as to their names.

Three names present themselves: *R. japonica, martensi* and *ornativentris*. Of these the types of the first two are in British Museum, of the last in Munich in the zoological collection of the Bavarian state. Letters with sketches illustrating the points mentioned above were written to Miss Joan B. Procter and Prof. Lorenz Mueller respectively who very courteously furnished me with the desired information for which I herewith wish to express my thanks.

Rana temporaria var. *japonica* was credited by Guenther in 1858 (Cat. Batr. Sal. Brit. Mus., p. 17) to "Schlegel, l. c.", and the "l. c." is "Schleg., Faun. Japon., pl. 3, f. 2," quoted on the previous page. However, Schlegel nowhere indicates a "var. *japonica*," but unquestionably the name should be applied to the form agreeing with pl. 3, fig. 2, reproduced in my Herpetology of Japan, 1907, pl. 11, fig. 1. It seemed likely to me that among the

specimens in British Museum received from Leiden (Boulenger's Cat. Batr. Sal. Brit. Mus., 1882, p. 47, specimens *a-c*) there might be one corresponding close enough to Schlegel's figure, as quoted above, to serve as lectotype. Miss Procter writes "I looked up the *a-c* bottle labeled *Rana japonica* and it now contains only two specimens. One agrees closely with the figure you give in Herp. Jap. pl. 11, fig. 1, and I labeled it 'lectotype' as you suggest." Her examination of this specimen reveals that the tibio-tarsal articulation reaches beyond the tip of the snout; throat immaculate; lower lip very faintly spotted; anterior part of lateral glandular fold practically straight. The name *Rana japonica* therefore belongs to the Japanese woodfrogs of the *dalmatina* (*agilis*) subgroup.

The name *Rana martensi* was given by Boulenger, (Proc. Zool. Soc. London, 1886, p. 414) to several specimens, Nos. 4410 and 4411, in the Berlin Museum brought by Professor E. von Martens from Tokyo. One of these, a female, greatly distended with eggs, was presented to the British Museum. Of the cotypes this one may now be designated as lectotype, and Miss Procter's examination gives the following result: Tibio-tarsal articulation reaches eye; throat immaculate; lower lip brown spotted; anterior part of lateral glandular fold practically straight.

It will be seen that the only difference between the lectotypes of the two names is the relative length of the hind legs, the tibio-tarsal articulation reaching beyond the tip of the snout in that of *R. japonica*, but only to the eye in the lectotype of *R. martensi*. I wish, however, to call attention to the fact that in the original description of the entire type material, Boulenger says that the tibio-tarsal articulation reaches the eye or *the nostril*. The vertical distance between the tip of the snout and the nostril is so slight, however, and the variation of the leg measurements in these frogs so great[1] that it is of no value whatever in distinguishing two forms *occurring in the same locality*. The straight course of the anterior portion of the dorso-lateral gland in the lectotype of *R. martensi*, on the other hand, plainly indicates that this specimen belongs to a form of the *dalmatina* subgroup. Under these circumstances I regard it as settled that *R. martensi* is a synonym of *R. japonica*.

Rana ornativentris was originally indicated, rather than described, as a variety of *Rana japonica* (Abh. Bayer. Akad. Wiss., II Kl., vol. 22, pt. 2, 1903, p. 383) from a single specimen collected by Professor Haberer at Nikko, Hondo. Professor Lorenz Mueller, custodian of the reptile collection in Munich, has kindly examined the unique type and sent me a sketch and full description of it, which in view of the scantiness of the original diagnosis, I reproduce in condensed translation as follows:

Description of type of *Rana japonica* var. *ornativentris:* General outline of snout and body that of *R. temporaria;* tibio-tarsal articulation reaches scarcely to the anterior angle of eye; the moderately excised web of hind feet reaches tip of toes except on the fourth toe where it reaches the base of the distal phalanx; the anterior end of the dorsal fold bends outward in the scapular region towards the tympanum, proceeds above the latter and then bends inward again towards the posterior angle of the eye, thus forming

[1]See notes under *Variation*, Herp. Japan, p. 110.

a double angle. Color above rather dark brown (like coffee with a little milk); between the eyes an indistinct dark cross-bar indistinctly edged with lighter; on the middle of the back from the scapular region backwards an ill-defined, paler, more grayish-yellow area; on the throat, fore neck, sides of breast, distal end of under side of femur and on tibia near the edges numerous larger, distinct, blackish brown (almost black) spots; ear patch, a line along the edge of the upper lip, and spots on the lower lip likewise blackish brown.

Dimensions.	*mm.*
Snout to vent	75
Snout to posterior rim of tympanum	22
Snout to anterior angle of eye	8.5
Longitudinal diameter of eye	8
Width of head in tympanic region	23
Foreleg	40
Hindleg from loin to tip of longest toe	125
Femur from loin to knee	35
Tibia	42
From tibio-tarsal joint to tip of longest toe	57
From posterior edge of inner metatarsal tubercle to tip of longest toe	41

From the description of the anterior course of the dorso-lateral ridge, it is evident that we have to deal with a form of the *temporaria* subgroup. Professor Mueller in his letter clearly points out this relationship to typical *Rana temporaria* basing his conclusions chiefly on the robustness and habitus of the whole body as well as the outline of the snout.

We have consequently come to the conclusion that the name proposed by Professor Werner belongs to the species of the *temporaria* subgroup already demonstrated to occur in the main island of Japan by the material in the National Museum. The strongly spotted underside of this form is alone sufficient to separate it from the typical form occurring in Yezo, and I propose to recognize the Hondo form as *Rana temporaria ornativentris* (Werner).

The type was collected in the mountains about Nikko; the three large specimens in the National Museum which agree so closely with the type are from Mount Fuji, where they may have been collected at a greater elevation than the numerous examples of typical *Rana japonica* which hail from the same general region. It is therefore quite likely that Professor Mueller is right when he suggests that *R. ornativentris* may be more or less characteristic of the mountainous regions and *R. japonica* of the lower altitudes of Hondo.

Rana tsushimensis was described by me in the Herpetology of Japan, 1907, p. 116, as probably nearest related to *R. amurensis*. Reexamined in the light of the additional character of the dorso-lateral gland the above statement is found to be correct, the anterior end flaring out as in typical *R. temporaria*. Miss Procter in examining the Tsushima woodfrogs in British Museum, noticed one specimen in which the ridge is "almost

straight on the right and flared on the left" side. In view of the general distribution of *Rana japonica*, it would not be surprising to find both species represented on Tsushima, and an occasional hybrid might perhaps be expected.

Rana longicrus, described by me in 1898 from Formosa, has dorso-lateral glandular ridges straight anteriorly and consequently belongs to the *dalmatina* subgroup, of which it is the most extreme member.

The Japanese woodfrogs may then be characterized summarily as follows:

a¹ Dorso-lateral glandular ridge anteriorly flaring out towards the tympanum, forming an angle with the continuation to the upper eyelid (*temporaria* subgroup).

b¹ Vomerine teeth between the choanae, only their posterior end projecting backwards beyond them; webs large.

c¹ Underside without large blackish spots on throat and breast
Rana temporaria (Linnaeus).
(Yezo; Sakhalin)

c² Underside with large blackish spots on throat and breast
Rana temporaria ornativentris (Werner).
(Hondo, mountains only)

b² Vomerine teeth behind level of choanae; webs small
Rana tsushimensis Stejneger.
(Tsu-shima)

a² Dorso-lateral glandular ridge anteriorly proceeding straight to the upper eyelid (*dalmatina* subgroup).

b¹ Hind legs much less than twice as long as head and body
Rana japonica (Guenther).
(Hondo, Kiushu, Shikoku, etc.)

b² Hind legs twice as long as head and body
Rana longicrus Stejneger.
(Formosa)